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RESEARCH CONTRIBUTION OF BIBLIOMETRIC STUDIES AS REFLECTED IN WEB OF SCIENCE DURING 2013-2017

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Abstract:

An attempt has been made in this paper to identify the research productivity on the bibliometrics subject published from 2013 to 2017 in the Web of Science database. 1422 research articles on bibliometrics published in various library science journals and indexed in the web of science database is considered as a basis of data for the study. In this article we made an attempt to analyze the pattern of publication of 1422 research articles. The study involved on various bibliometric components such as annual growth rate, authorship pattern, distribution of contribution by country wise, language wise, institution wise, most prolific author in the field, high productivity of Journals, etc are studied. On an average 284 articles were published in each year during the study period and highest number of articles are recorded in the year 2016. Further, USA is a contributed the highest number of research articles (22.2%). The journal “scientometric” ranks as the first core journals in the subject of library science by contributing 37% of the total publications. Finally, the study concluded that there has been consistent growth of literature in the field of bibliometric studies and also given data set well fitted with the Bradford law of scattering of literature.

Key words: Bibliometrics, Scientometrics, Webometrics, Library Science, Funding Agencies, Bradford’s Law, Growth Rate.

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1. Introduction:

The Bibliometrics is the application of statistical and mathematical methods to bibliographical studies and all forms of written communications opined that, “It is used to identify the pattern of publication, authorship citation and coverage of journal papers in terms of geographic, subject, organization and other related parameters”. (Hazarika, Goswami and Das (2003)

It was Pritchard (1969) “who first coined the term Bibliometrics, in his article “Statistical Bibliography or Bibliometrics” in the journal of Documentation. Though the term is of recent origin, its application and practice may be traced back to 1917 through literature survey. The term has its roots in “bibilio” and “metrics” or “metrics” means book and measurement. Pritchard has defined bibliometrics as “the application of Mathematics and Statistical Methods to books and other media of communications”.

“Bibliometric is one type of research technique employed by the researcher in different subject disciplines. Bibliometrics method is meant for a verity of purposes similar to the determination of different scientific pointer, the evaluation of scientific output, the selection of journals for libraries and even the predicting of possible Nobel Laureates” (Zafrunnisha, 2012). The term Bibliometrics has been defended as the “application of mathematics and Statistical Methods to books and other media of communication. Initially, this concept originated as statistical Bibliography and subsequently developed into a major field, now commonly known as bibliometric studies. It is used for evaluating text and information in this field. The bibliometric is quantitative in nature and this technique can be effectively used in the field of library and information science for the study of literature. It is observed that in the field of library and information science this type of research is used more effectively to determine trends in literature. Bibliometric studies are useful particularly for the evaluation of library services, resources allocation, decision making collection resources sharing and weeding. So, bibliometric analysis has become a well established part of information research”. (Zafrunnisha, 2012). Bibliometric study accurately used by the researchers to identify user requirement. In the current study an effort has been made to study the some characterstics of bibliometrics literature.

2. Review of Literature:

In this review of the literature, only a few articles are covered. Ahila, M. and Nagarajan, M (2011) “analyses the research output performance on Pharmacology. A total of 22,065 research articles published in Web of Science were analyzed to find the performance of scientists from all over the world in terms of growth during the period 1999-2010 (12 years). Annual growth rate, global publication share and rank among 15 countries of the world, authorship pattern, high productive Institutions, Journals, etc are discussed”. Dillip K Swain, Chandrakanta Swain,

Bijayalaxmi Rautaray (2014) “examined the patterns of publications in the Journal of Educational Media and Library Science (JoEMLS) from 2008 to 2012. It is observed that publications of JoEMLS are led by two-author papers, followed by single-author papers and three-author papers. The degree of collaboration in JoEMLS publications is found to be 0.63. Taiwan occupies the top position in the country-wise ranking of publications, followed by China and Malaysia. The frequent occurrences of keywords indexed in the articles, like ‘bibliometrics’, ‘information literacy’ and ‘digital archive’, indicate its research focus on promising areas of librarianship. On examination of citations of all the published articles of JoEMLS, it is found that among the 99 published papers; only 17 have received their relative impact as they have been more or less cited in other different published sources”.

Jayaprakash (2015) studied “Bibliometric analysis of publications on cloud computing published in the Emerald journals from 2000 to 2014. This study has undertaken total 781 publications and found that 37% of the articles are contributed by a single author. Majority of the contribution among the published literature to cloud computing is from Library Hi Tech News and Library Hi Tech journals respectively”. Mulla, K.R. and M. Chandrashekara (2011) “identified some Bibliometrics indicators of 2253 articles published on industry and trade during 2002-2006. The online database of the *Indian science abstracts* website (<http://isa.niscair.res.in/>) is the main source for this study. The average number of publications per year is 451, the highest number of articles were published during 2004 to 2006 i.e., 1690. Authorship trend shows that maximum numbers of 968 (42.96%) papers were contributed by corporate bodies. The degree of collaboration in industrial and trade literature was 0.61. In the country wise contribution of documents, India contributed 69.86% of the total publication. In the state-wise contribution of documents, Maharashtra stands first with 323 (14.34%). Among journals *Indian Journal of Fiber and Textile Research* is ranked first with 327 (27.88%) articles and among corporate bodies, Procter & Gamble Company stands first with 172 (17.77%) documents”.

Vahida Beegam T (2015) study is focused on “literature analysis of cloud computing in LIS field in Emerald Insight during the period of 2009-2014. This paper covers mainly authorship pattern, chronological-wise and geographical-wise distribution of articles / publications, type of references and number of references cited in the contribution of the journals and prolific contributions to the journal. The results showed that a number of articles increasing from year to year and the most prolific journal were Library Hi Tech News during the period under study”. Venkatesha Y., Selvaraja A., Nischitha N. (2012) highlighted the “publication pattern in the field of telemedicine-based on the analytical study of the bibliographic details of journal articles by using ‘Google Scholar’. An attempt is made to study the pattern of authorship and distribution of articles. The study also projects the chronological distribution of articles and the core journals in the discipline of telemedicine. The findings of the study will help the researchers to know the ranking of journals and further the aspects dealing with collaborative research.

Recommendations have also been depicted that in order to overcome barriers and constraints while accessing telemedicine literature”.

3. Aim of the study:

The main objectives of the study

1. To quantify the scientific productivity of bibliometric literature
2. To examine the type of documents covered under study
3. To know the distribution of publications through language wise
4. To know the most productivity of authors in the field of Bibliometrics
5. To find out the institution wise and country-wise share of publications
6. To observe the funding agency wise distribution of publications
7. To study the applicability of Bradford law of dispersion
9. Finally to identify the subject wise distribution of articles in Bibliometrics

4. Methodology:

The current study, necessary data has been collected from Web of Science website on the internet during the study period of 2013-2017 and it is the major source of information for the current study. It showing a large number of articles, books, reviews, case studies letters etc. the web of science is indexing online database published by Thomson Reuters to meet the purpose of the current study. Required information was collected in the form of authorship pattern, distribution of contribution by country wise, language-wise, institution wise, most prolific author in the field, high productivity of Journals, etc. These data were analyzed and presented in different tables and figures as shown below.

5. Data Analysis and Interpretation:

The Web of Science database has extracted every feature such as author(s), year of publications, type of article, the name of journal(s), etc. of all articles published from 2013 to 2017 were recorded for the following analysis.

Table No. 5.1 Contribution by Type of Documents

Document Types	Publications	%
Articles	1223	84.81
Reviews	105	7.28
Editorial Materials	54	3.74
Proceedings Papers	24	1.66
Book Review	19	1.31
Letters	17	1.17
Total	1422	100.0

We have different type of communications in different publications; Table No. 5.1 reveals that, document wise distribution of Bibliometric literature. It can be noted that, majority (85%) of authors chosen to use journal articles as the main resource of reference for their publication, followed by Reviews (7%), Editorial Material (4%), Proceedings Paper (2%), Book Reviews (1%) and Letters (1%) respectively. Journal articles holds first place as usual compared to other fields.

Table No. 5.2 Language Wise Distribution of Publications

Languages	Publications	% of 1419
English	1247	87.87
Spanish	83	5.84
Portuguese	59	4.15
German	9	0.63
French	9	0.63
Italian	4	0.28
Turkish	3	0.21
Russian	3	0.21
Lithuanian	2	0.14
Total	1422	100.00

Table No.5.2 revealed that the majority of the publications published in the English language (88%), followed by Spanish 6% and Portuguese with 4%. Remaining languages such as German, French, Italian, Turkish, Russian and Lithuanian contribution to this Bibliometric study is less than 1%. Again it is proved that English is the universal language of the world.

Table 5.3 Author wise distribution of publications

The ranking list of authors helps professionals in many ways, an example for deciding popularity, to select reading materials, to decide acquisition policy and so on.

Authors	Publications	% of 705	Nationality	Rank of Author
Bornmann L	53	7.51	Germany	1
Abramo G	48	6.80	Italy	2
D'angelo C A	47	6.66	Italy	3
Prathap G	15	2.12	India	4
Leydesdorff L	15	2.12	Netherlands	
Marx W	13	1.84	Germany	5
Porter Al	12	1.70	USA	6
Lariviere V	12	1.70	Canada	
Aleixandre-Benavent R	12	1.70	Spain	
Haunschild R	11	1.56	Germany	7
Others	482	68.36	-	

Table 5.3 presents the most prolific authors who have contributed to the field of bibliometric studies. It is observed that Bornmann L has made the highest contribution by publishing 53 research articles during the study period (2000-2010). The next highest contribution is made by Brammo G with the publication of 48 articles. D'Angelo C A got the third rank with 47 (6.66%) articles, Prathap G and Leydesdorff L got the fourth rank with 15 (2.12%) articles, Marx W got the fifth rank with 13 (1.84%) articles, sixth rank with 12 articles each got by Porter AI, Lariviere V and Aleixandre-Benavente R. Whereas, Haunschild R occupies the seventh rank with 11 articles. Other single authors shared and got 8th rank by contributing four hundred and eighty-two (68.36%) articles on bibliometric studies.

Table No. 5.4 Institution Wise Distribution of Publications

Organizations	Publications	% of 713	Rank
University Roma Tor Vergata	48	6.73	1
Max Planck Gesell	36	5.04	2
National Research Council Italy	34	4.76	3
University of Valencia	23	3.22	4
University of Sao Paulo	21	2.94	5
University of Granada	21	2.94	
University of Fed Santa Catarina	21	2.94	
Max Planck Institute of Solid State Research	21	2.94	
Chinese Academy of Science	19	2.66	6
Not Known	19	2.66	
Wuhan University	18	2.52	7
Other Institutions	432	60.58	8

Table No. 5.4 presents data on the number of documents on Bibliometrics subject contributed by various universities and different organizations in the world. Out of the total of 713 contributions, the highest number i.e., 48 (6.73%) were contributed by University of Roma Tor Vergata, followed by Max Planck Gesell with 36 (5.04%). National Research Council Italy secured 3rd rank by publishing 34 (4.76%) articles. The University of Valencia came in 4th place by publishing 23 (3.22%) articles, 5th rank are shared by three universities (the University of Sao Paulo, University of Granada and University Fed Santa Catarina) and one Research Center (Max Planck Institute of Solid State Research) with 21 (2.94%) articles. 19 (2.66%) each article is published by Chinese Academy of Science and another 19 (2.66%) articles authors are not known. 18 (2.52%) articles are published by Wuhan University and majority 432 (60.58%) articles are published by different organizations and universities.

152 (21.31%) publications are from different universities and occupied first place in this study, 110 (15.42%) publications are from various research organizations in the world.

Table No.5.5 Funding Agency wise Distribution of Publications

Funding Agencies	Publications	Nationality	% Of 1199
National Natural Science Foundation Of China	34	China	2.83
National Science Foundation	10	USA	0.83
National Social Science Foundation Of China	7	China	0.58
National Natural Science Foundation Of China Nsf	6	China	0.50
Intramural Nih Hhs	6	USA	0.50
Cnpq	6	Brazil	0.50
Wellcome Trust	4	UK	0.33
Spanish Ministry Of Science And Innovation	4	Spain	0.33
Nsf	4	China	0.33
National Natural Sciences Foundation Of China	4	China	0.33
Others	58	-	4.83
Not contain the name of the Funding Agency	1056	-	88.07

Table No. 5.5 shows that the National Natural Science Foundation of China leads the table with its 2.83% of publications being featured in the funding agency followed by the National Science Foundation with 0.83% publications and National Social Science Foundation of China with 0.58% and 88.07% of the publications funding agency names is not provided by the authors. Remaining 4.83% publications are funded by other funding agencies.

China is leading in funding the Bibliometrics study as majority 55 (4.57%) articles and followed by the USA with 16 (1.33%) articles funded by respective countries. Less than 1% of the articles are funded by Brazil, UK and Spain in this study period on Bibliometrics.

Table No. 5.6 Country wise distribution of publications

Countries/Territories	Publications	Percentage
USA	286	22.27
China	159	12.38
Spain	146	11.37
Brazil	120	9.34
Germany	109	8.48
England	100	7.78
Italy	96	7.47
Canada	76	5.91
Netherlands	62	4.82
Australia	58	4.51

Other countries	58	4.51
Not known	14	1.09

Table No. 5.6 shows that the country-wise distribution of the articles and reveals that out of ten nations, USA is leading with 22.27% of the articles, followed by China and Spain with 12.38% and 11.37%. Brazil, Germany, England and Italy published 9.34%, 8.48%, 7.78% and 7.47% of the articles respectively on Bibliometrics. Canada 5.91%, Netherlands, Australia and other countries contributed less than 5% of the publications to the Bibliometrics study. 1.09% of the articles have not mentioned their country name.

Table No. 5.7 Source and Zone wise Ranking of publications

Source Titles	Publications	% age	Cumulative Percentage	Rank	Zone
Scientometrics	232	37.00	37.00	1	232
Journal of Informetrics	77	12.28	49.28	2	202
Journal of The Association For Information Science And Technology	65	10.36	59.64	3	
Journal Of The American Society For Information Science And Technology	21	3.34	62.98	4	
Current Science	20	3.18	66.16	5	
Technological Forecasting And Social Change	19	3.03	69.19	6	
Research Evaluation	17	2.71	71.9	7	193
Qualitative Quantitative Methods In Libraries	15	2.39	74.29	8	
Revista Espanola De Documentacion Cientifica	14	2.23	76.52	9	
Renewable Sustainable Energy Reviews	11	1.75	78.27	10	
Other Journals	136	21.69	99.96		

Ranking of the periodicals/journals is based on their research productivity on Bibliometrics subject for the year 2013-2017 is given in Table No. 5.7 Scientometrics journal holds the first rank with 37% and published the majority number of articles compared to any other journals, in the field of Bibliometrics

Production of Journals on the topic of Bibliometrics

In order to calculate the efficiency of journals, the total 627 number of publications were divided into three equal groups of publications each.

It is understood from the above table that, the first group of publications are from the first 1 journal in the ranking order, so it is suggesting their high rate of productivity is in the Scientometrics journal. The average productivity of each journal in this second group is 40.4 articles, where it has been considerably gone downward to 14.25 articles in the third group. This distinction confirms the declining productivity of individual journals in the ranking list.

6. Applicability of Bradford's Law of Scattering

The Bradford's Law serves as a general guideline to librarians in determining the number of core journals in any specific subject discipline. It states that journals in a single field can be divided into three parts, each containing the same number of articles.

5.7 A: Distribution of Publications over Bradford's Zones in Bibliometrics

Zone	Total No. of		Percentage
	Publications	Journals	
1	232	1	0.68
2	202	5	3.42
3	193	140	95.89

In order to examine the algebraic analysis of the Bradford's Law of Scattering, the top 10 journals are arranged according to their decreasing frequency of articles publications and separated into three zones, so that, each zone contains an approximately equal number of articles. The distribution of the publications according to Bradford's zones is represented in the above table 5.7, 5.7 A.

Zone-1: Core journals in Bibliometrics subject, is relatively only one journal but, it has produced approximately more than one-third of all the articles. In this study, it is found that Scientometrics journal only published 37% of the articles in the field of Bibliometrics in the last five years of the period and placed at number one place.

Zone-2: is having little less number of articles around 32% but published in more number of journals compared to zone one journal. Here, 32% of the articles are published in five different journals i.e:- Journal of Informetrics, Journal of the Association for Information Science and Technology, Journal of the American Society for Information Science and Technology, Current Science and Technological Forecasting and Social Change.

Zone-3: In the third zone, little less number of articles (30%) is available compared to zone 1 and 2, but still these articles are published in a greater number of journals (140) compared to zone 2 journals.

It is observed, there is one journal in the nucleus and it is the most productive journal devoted to Bibliometrics subject sharing a 37% of the total article publications in journals. The second zone is represented by 5 journals which shared 32% of the total articles published in the journals, and the third zone is represented by 193 articles which share a very less 30% of the total articles published in 140 journals in the field of Bibliometrics.

Each zone has almost one-third of the total publications. According to Bradford law, the zones identified will outline an approximately geometric series in the form of 1: n: n². The relationship of each zone in the present study is in the ratio of 1:5:140. Above table shows the similar results and hence the journal data fits well with the Bradford's Law of scattering.

Table No. 5.8 Subject wise Distribution of Articles

WOS Categories	Publications	% age
Information Science Library Science	620	40.41
Computer Science Interdisciplinary Applications	326	21.25
Computer Science Information Systems	133	8.67
Multidisciplinary Sciences	61	3.97
Management	60	3.91
Surgery	50	3.25
Business	50	3.25
Education Educational Research	49	3.19
Environmental Sciences	37	2.41
Public Environmental Occupational Health	35	2.28
Other subjects	113	7.36

Table No. 5.8 shows the subject wise distribution of articles. 40% of the articles are published in the subject of Information Science and Library Science, next place is taken by computer science Interdisciplinary applications and third place is taken by the computer science information systems. Multidisciplinary sciences, management, surgery, business, education and educational research, environmental sciences, public environmental occupational health subjects with below 4% of the subject. Only 7% of the articles are related to other different subjects.

7. Findings

1. Journal articles hold first place, compared to other fields and found that majority 85% of publication output is in article form published in these journals.
2. Again it is proved that English is the universal language in this study also, as more number of articles (88%) published in the English language.
3. A prolific author of the study is Bornmann L and got the first rank with 53 (7.51%) articles.
4. The highest number of articles 48 (6.73%) were contributed by University of Roma Tor Vergata.
5. 2.4% of publications are funded by National Natural Science Foundation of China.
6. China is contributed with 11% of the articles in this field of study.

7. Scientometrics journal holds the first rank with 37% and published the majority number of articles compared to any other journals, in the field of Bibliometrics. 40% of the articles are published in the theme of Information Science & Library Science.
8. The maximum number of articles published in 2016 produced on Bibliometrics and received the highest number of citations also.
9. The study discovered the Italy and Germany's authors are publishing more number of articles on Bibliometrics from 2013 to may 2017.
10. The study found that various Universities in the world are published the highest number of publications compared to Research Organizations.
11. China is encouraging Bibliometrics study through their different research organizations, as it is reported in this study that, majority 55 (4.57%) articles are funded China sponsored research organizations.

8. Suggestions

It is suggested that a large number of nations, as well as funding agencies, should come forward in providing financial assistance to the researchers as in this study it is depicted that, very less number of authors got financial assistance from the funding agencies. If assistance comes from the government/learned organizations, then this Bibliometrics subject will grow very fast, and which is essential to assess higher educational institutions and their research impact.

9. Conclusion

Bibliometric analysis is a reliable tool to evaluate and trace the research trend and quality of scientific output. It can be inferred that from this study that Bibliometric studies are one of the most upcoming subjects in Library science. The result of the study shows that, there was a noteworthy research activity in the subject of bibliometric studies. This reveals that, most of the research articles have been published in the English language; China and USA are the main contributors to research publications in the field of Bibliometrics studies, further, most of the research publications published in the form of research publications. China is encouraging research activities in the field of Bibliometric studies. The result of the study helps the librarians in the selection and in the procurement of journals in the field of Bibliometrics. It also helps them in proper organisation and management of this literature for better use by the scholars in the field. In general, the study reveals the trend of the field.

Finally, it can be concluded that Bibliometric studies is one of the promising area of research in the library science discipline.

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